

Radiological Observations on the Colon

By DOUGLAS BOYD, M.B., D.M.R.E.

Honorary Radiologist to the Mater Infirmorum Hospital, Belfast; The Belfast Hospital for Sick Children, and the Benn Hospital

RADIOLOGY of the colon is at times a spectacular pastime, because unfortunately the only successful way of demonstrating many forms of pathology is to go contrary to nature, and, as might be expected, the bowel objects to such procedures. In other words, one takes the retrograde path and attempts to outline by barium enema what one would have been very glad that nature could herself have demonstrated with barium by the oral route.

At the very beginning I want to emphasise two very important matters. Firstly, carcinoma of the colon can very rarely be demonstrated by follow-up films. Certainly it can never be excluded by such methods. I have known even the very grossest of lesions fail to be demonstrated in twenty-four- and forty-eight-hour films, and such is universal experience. To rely on follow-on films to demonstrate carcinoma of the colon is to deliberately invite diagnostic disaster.

The second point is that new growths in the sigmoid and in the walls of the rectum are often very difficult and in some cases impossible to record radiologically, because of overlapping shadows and other anatomical and radiological reasons. Co-operation with the surgeon is essential, because the proctoscope and the sigmoidoscope will reveal what radiology may have entirely failed to demonstrate.

A great deal of the fascination of the radiologist's work is that he never knows what he is going to find. Interesting anatomical abnormalities are of quite regular occurrence, and many pathological changes are radiologically spectacular. An important source of speculation and research is, why did a certain type of lesion give the particular symptoms complained about by that patient? A great deal of the radiologist's diagnostic work is concerned with excluding a number of causes for some complex group of symptoms and at the same time keeping a weather-eye going, as it were, for pathology or variations of development of all types and in all near-by regions.

If time is in any way short, it may be a relief to find the diagnosis staring one in the face, as it were, but there is infinitely more satisfaction, and very much more anxiety, if one only arrives at a correct or nearly correct conclusion after an arduous search, or even arrives at the diagnosis by the exclusion of other conditions or in some such indirect manner.

It is unfortunate that a barium enema is one of the most uncomfortable and unpleasant forms of radiological examinations. It sometimes is all over very quickly and very easily, but it is not always so. By no means does every enema go according to plan!

For some curious reason when preparing this paper I have been mentally very reluctant to describe what is called the normal colon.

This instinctive opposition may be psychologically and physiologically sound, because really we do not know what is the normal colon. There is great personality in bowels! The colon really does reflect changes in the psychological outlook of the owner! I have never been quite clear what was meant exactly when it was said that "his bowels moved with compassion," but one cannot study the alimentary system and fail to realise the tremendous influence that the mind has upon the entire tract.

I have not yet given any barium enemas to cats, and I cannot confirm or disapprove the famous experiments of Cannon on peristaltic movements on cats of male and female variety. Describing his famous experiments in 1911, he writes: "In some animals peristalsis was perfectly evident, and in others there was no sign of activity. Several weeks passed before I discovered that this difference was associated with a difference in sex. The male cats were restive and excited on being fastened to the holder; but the female cats, especially if elderly, submitted with calmness to the restraint, and in them peristaltic waves took their normal course."

I wonder if one might describe the normal colon as one which never gave the patient any trouble. In other words, a colon which existed with as little indication of its working as the normal heart, excepting only the exhibition of what I might term the recto-sacral reflex, at times convenient to the pleasure of the owner.

Such a colon, to the radiologist, is laid out with all the appearance of harmony. The haustrations preserve a very reasonable regularity with a clear symmetrical formation. There are no regions of flattened haustra, there are no parts of spasm, and the saw-toothed irregularity of irritation is absent. There may be abnormal loops or, far better termed, *unusual* loops, and even the suggestion of kinks, but many such conditions may not disturb functioning, and so we have no right to describe as pathological such departures from what we are pleased to call the normal.

The commonest disturbance is a functional unbalance. In these days it is almost a rarity to find a colon unaltered by some condition, and some of the advancing stages of functional unbalance are almost universal.

The change due to imbalance of the normal neuro muscular mechanism has been described as spastic colitis, the hypertonic colon, muco-membraneous colitis, mucus colitis, nervous diarrhoea, constipation, the greedy colon, the dyskenetic colon, the deranged colon, colo-spasm, and a host of other terms.

Kantor was the first to recognise that in a phase of the condition there was a decreased and not increased tonus, and to suggest the use of the term the "unstable colon."

The normal colon has been described as having even and clear-cut segmentation. The deranged colon exhibits no such regularity of character and no such symmetry

of purpose. In the earlier stages during the periods of increased tonus there is an increase in the depth of the haustrations, a narrowing of the central canal, and a tendency towards a developing uneven formation.

A fairly constant sign at the earlier stages is a duplication of the haustrations in the longitudinal axis, producing the appearance of two segments on one side facing a single segment on the opposite. Some inches of the bowel may then develop haustrations of such depth that barium in the extreme outer parts may be isolated. I have seen barium isolated in such a way described as diverticula. Later sections of commencing saw-toothed irregularity begin to develop and there are regions of spastic narrowing.

In the atonic periods, in the earlier stages of relatively short duration but later increasing in duration and ultimately predominating, there is a broadening of the central canal and a flattening of haustrations. Finally there is a development of an atonic colon with a dilated cæcum.

The rate of emptying is very variable and with the same patient is inconstant. Almost invariably these people complain of constipation. I want to emphasise these words—they *complain of constipation because very few of them in the proper sense of the word are constipated.*

If examination is made following an aperient, the barium meal may pass to the rectum even within so short a period as four hours. Such intestinal hypermotility suggests a rapidly emptying bowel, but is merely a trap for the unwary, because in these patients films at twenty-four, forty-eight, and seventy-two hours so very often find little or no change in the original four-hour distribution. I believe that very often the initial rapid distribution is because the large colon is empty at the time the barium arrived into it from above. Certainly very many of these patients with deranged colons may be grouped under the heading the chronically empty colon, or be said to be suffering from aperient colitis. Both diseases are the same, and almost invariably are *contracted by inoculation by the Press!* The disease is contagious and is known to run through the family group!

I mention it here because there is a matter of great importance attached. You will have heard how the bulk of these sufferers have for the greater part of the time, in the earlier stages of the derangement, when there is every prospect of cure, a colon which is hypertonic and irritable. These are the worst possible colons for a diet of coarse residue roughage, and yet this is the treatment so often prescribed.

The cycle to be broken down is a bowel emptied by aperient—lack of content for the gut to grip upon—delay—dehydration—formation of hard fæcal masses with irritation of the bowel-wall, and so further interference with muscular co-ordination and generally periods of spasm. At this stage the patient, impatiently awaiting a delayed evacuation from a colon which is practically empty, takes another aperient. The result may or may not be satisfactory from the limited viewpoint of the patient—they are so delightfully vague in the use of such a word!—and then the whole cycle starts again.

Alvarez may be correct when he surmises interference *with the gradient of gut*

tonus. It is interesting that many of these cases get reverse peristalsis in which faecal masses may be carried from rectum or sigmoid back to the caecum.

I would say that diverticula in all probability is the next commonest condition to be found in the colon.

Colonic diverticula were mentioned first in Matthew Ballies' "Morbid Anatomy" in 1794, but it is only comparatively recently that the disease has found prominence in medical publications. For instance, it is authoritatively stated that prior to 1913 none were diagnosed prior to operation. In the latter part of 1913 and in early 1914 Quervain, Hurst, and Case all reported pre-operative diagnosis of the condition in each instance by X-ray. The list of authors contributing reports in the years following is simply overpowering.

The mere presence of diverticula without inflammation sufficient to bring the patient for investigation is extremely high. Beer states that over one-third of the aged have diverticula, and Roberts is most emphatic that every pot-bellied individual over 60, particularly if there is a history of long-standing constipation and lower abdominal discomfort, is likely to have multiple diverticula of the colon.

A solitary diverticulum with evidence of inflammation is rare. It may be suspected by a sharply localised region of irritable gut, or demonstrated as filled with barium or partly filled with barium and faecal matter.

It should be remembered that, not infrequently, the narrow stems connecting the diverticula with the lumen of the gut may be blocked by oedema and prevent the entrance of barium; and a region of spastic irritable gut, particularly in the descending and sigmoid regions, together with localising discomfort by the palpating hand of the radiologist, is almost invariably due to diverticulitis.

In other instances grape-like clusters of diverticula may be festooned along sigmoid and descending colon. They also occur in the caecum, but rarely.

Acute paresis of the descending colon is an interesting condition. Some years ago I noticed that it not unoften happened that a patient was sent for investigation with symptoms of obstruction. The radiological investigation found in some cases little other than a gas-filled, rather broader and almost relaxed-looking region of descending colon. Inquiry made me suspect very strongly that some of the patients, prior to the attack of obstruction, had passed a small renal calculus, and gradually I came to realise that disturbance of the left side of the colon low down could follow a left renal colic.

While it is well recognised that almost any acute abdominal crisis such as abscess, obstruction, acute hernia, and renal colic may be the cause of acute pyloric spasm, the pathway between kidney and colon may not receive the recognition which it deserves clinically. Once recognised, one watches for referred symptoms, and so very often something in the history will give a clue.

Sometime the reflex is reversed. A localised inflammatory condition, generally due to diverticulitis, may produce a symptom complex of frequency of micturition, *due to irritation of the bladder* and pain in the left flank of a colicky nature, and the whole picture suggest a urinary calculus. Close questioning of one of these

patients gave the information that the worst of his pain, duration intermittently about three weeks, was in the morning on his way to work. His bowels opened regularly after breakfast and just once or twice he had slight diarrhoea. The enema-can was ready almost before the negative result of the renal film and a few minutes found the region of diverticulitis.

I have been curious to find a pathway. There is a definite neural "link-up." Branches of the right vagus run to the posterior wall of the stomach, left kidney, and left colon. The sympathetic supply to the left kidney is aortic plexus and semi-lunar ganglion, while a prolongation of the aortic plexus supplies the sigmoid and upper part of the rectum.

It is not infrequently impossible to distinguish radiologically or even surgically between certain forms of diverticulitis and carcinoma. If I may quote from one of the more recent textbooks on radiology: "It is the difficulty if not the impossibility of distinguishing between certain forms of diverticulitis and neoplasm which makes the whole problem of diagnosis so difficult and so great a source of anxiety."

Carcinoma may be complicated by diverticulitis or diverticulosis. The picture in cases of hypertrophic diverticulitis is indistinguishable from new growth in a fair number of cases and repeated examination may be necessary to decide if irregularity is due to invading neoplasm, or inflammation arising from diverticulitis. Certain factors may incline the diagnosis one way or other, but under certain circumstances one can only say, "I suspect this is malignancy, but I am not certain," and await either the results of further investigation or an opportunity of repeating the radiological examination after a period of treatment.

In malignancy the picture is constant. In diverticulitis the tumour mass has a tendency to be variable.

In carcinoma bleeding is not infrequent. In diverticulitis bleeding is limited to a comparatively small number of cases.

In carcinoma the mucosal pattern shows considerable destruction. In diverticulitis such destruction is not so marked.

In carcinoma the obstruction tends to be early and complete. In hyperplastic diverticulitis the obstruction tends to be late and incomplete.

The question of tenderness on deep palpation is one of considerable interest. It is a fact that a limited number of intelligent patients may communicate an appreciation to the radiologist of the nature of the discomfort caused by a very deep and forceable type of palpation, best carried out under the fluorescent screen.

Pain, often of the mild toothache type, is caused by palpation over a hyperplastic mass of diverticulitis. With a new growth one gets the impression that there is a numb pain, a very much lesser degree of sensitivity, and a much more mobile tumour, but there are so many qualifications necessary to such statement and the whole field of visceral sensation is one of so much divergence of opinion and of difficulty, that I hesitate almost to refer to the matter at all. I can only say that such help at times may be of real value, and I want to stimulate interest in anything which may, even occasionally, be of diagnostic value.